SYRACUSE, N. Y.

SEMICONDUCTOR PRODUCTS

NEWSLETTER

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THE SYLVAN STORY

Since Pete Sylvan might, one of these days, come stomping into your abattoir to help you with an applications problem, it might be well for you to know a little bit about the guy.

Stan Brown (right), Mr. Unijunction himself, administers the quality-oath-of-the-unijunction to Pete Sylvan.

Pete joined Hugh Lowry's applications engineering group, here at Syracuse, in August. He's a Bowdoin College graduate, class of '52. Upon graduation, he joined the glorious General Electric Company and was assigned to the physics program. His assignments covered germanium rectifiers, atomic reactor instrumentation, and hydrogen thyratrons.

After completing the program, he joined the G-E Advanced Electronics Laboratory at Ithaca, N.Y. and, for three years, worked on transistor circuit applications (he *did* sneak away to Cornell, during this period, to do some advance-degree work on a Swope Fellowship).

So, now he's ours. Since Pete worked with our unijunction device at Ithaca, Stan Brown, the unijunction's Engineering protector, gave him the oath of office, and now they share all the fame and fortune.

CUSTOMER CONFIDENCE 10th ANNIVERSARY SEMICONDUCTOR PROGRESS

Progress Is Our Most Important Product

GENERAL ELECTRIC

SEMICONDUCTOR PRODUCTS DEPARTMENT
ELECTRONICS PARK SYRACUSE, N. Y.

OUR UNIJUNCTION HAS ACQUIRED A FAMILY!

New specification sheets will portray our silicon unijunction transistor (which isn't necessarily a transistor) as a hydra-model device comprised of six types—2N489 thru 2N494, previously designated the 4JD5A1 and, in the beginning, it was the ZJ-14.

Pete Sylvan, applications engineer and submitter of the new specs, sets the unijunction down as a (or an) hermetically-sealed three-terminal device having stable N-type negative resistance characteristics over a wide temperature range. And, according to Pete, a high peak-current rating makes the device useful in medium-

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power switching and oscillator applications where it does the circuit work of two conventional silicon transistors.

Housed in the jetec package, with triangular-lead configuration, there's no problem in plunking unijunctions into printed boards with your automatic-assembly equipment. Absolute maximum ratings (25°C.) might be in order at this point:

RMS Power Dissipation*	**250 mw**
***Stabilized**	**350 mw**
RMS Emitter Current	**50 ma**
Peak Emitter Current (T_J = 150°C.)	**2 amps**
Emitter Reverse Voltage (T_J = 150°C.)	**60 volts**
Operating Temperature	**−65°C. to 150°C.**
Storage Temperature	**−65°C. to 200°C.**

WHADDYA MEAN IT ISN'T NECESSARILY A TRANSISTOR?

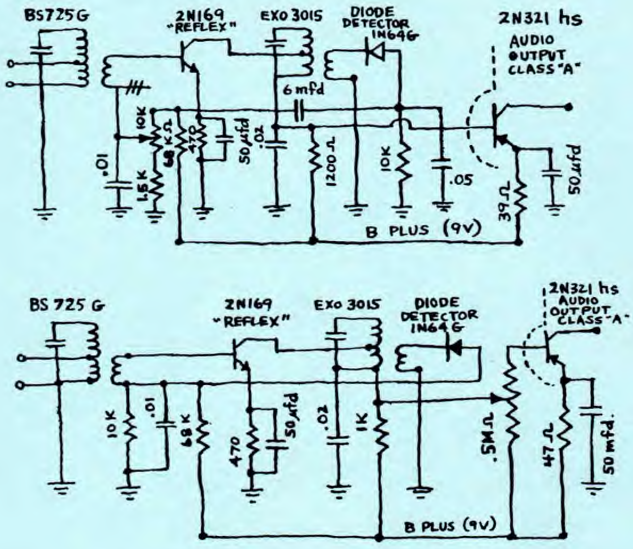
Well, Dr. I. A. Lesk, of the G-E Advanced Semiconductor Laboratory, invented the little component as a double-base diode. Stan Brown, project engineer and paternal guardian of the device, will look you straight in the eye and tell you that, though the unijunction works terrifically well when used in classic transistor applications, versatility-wise it's very much like a resistor in that a single type can be used in a wide range of applications (it's not a resistor) and, well, what he means is that the little devil might be likened to a zener diode (it's not a zener diode) because every one you make, you can use.

Pete Sylvan rationalizes that, since industry nomenclature dictates that a transistor is any three-terminal device which provides gain, what the heck, the unijunction is a transistor.

REFLECTIONS ON REFLEXES

We just gave you the scoop on our heat-sink project; now let's look at a circuit with the principles applied.

Erich Gottlieb, applications engineer, offers these two circuits, both of which show a heat-sunk G-E 2N321 transistor in action and, also, the 2N169 NPN he loves so dearly for reflex circuit applications.



Both circuits have a single-end output stage which delivers a power output of 100 mw at 10% distortion.

As *anybody* can plainly see (ah kin see), that Type 2N231 output transistor definitely has a heat sink . . . and that, according to Mr. Gottlieb, is why the heat is conducted away fast enough to provide you with the healthy rating.

Erich pointed out that, since the battery drain at this class A power level is relatively high, as compared to class B push-pull, the circuits permit reduction of battery drain as a function of decreasing volume requirements. Both circuits have been designed into our recommended four-transistor reflex receiver.

AD FEATURES MEDIUM-CURRENT THUMB

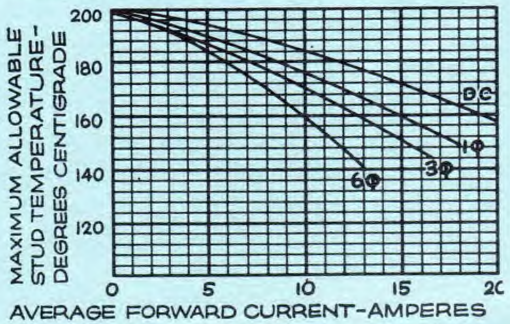
Our October advertisements feature a thumb and a forefinger, between which languishes a G-E silicon medium-current rectifier. The headlines pretty well point up the features of this new 20-amp beauty: *In low-current applications:* BETTER PERFORMANCE AT EQUAL COST! *In high-current applications:* EQUAL PERFORMANCE AT LOWER COST!

To expand on this theme: In applications where you would normally use a 2- to 10-amp rectifier, this device will get you superior electrical characteristics at the comfortable price you'd have to pay for lower-rated units. And, anywhere you would apply a high-current unit (up to 20 amps), you can glean equal performance from this rectifier at *less* cost.

Four types are available—1N1301, 2, 4, and 6. All are of standard stud design, which makes them completely interchangeable with most extant studs. Now for the big picture:

OPERATING VOLTAGE	**—1N1301 50 PIV**
	—1N1302 100 PIV
	—1N1304 200 PIV
	—1N1306 300 PIV
OPERATING CURRENT	**—up to 20 amperes**
OPERATING TEMPERATURE	**—up to 200° C**
PEAK ONE CYCLE SURGE CURRENT	**—300 amperes**
MAXIMUM FULL LOAD VOLTAGE DROP (full cycle average —10 amps, 200° C junction temperature)	**—0.5 volts**
MAXIMUM LEAKAGE CURRENT (full-cycle average, 200° C junction temperature)	**—5 ma**

MAXIMUM ALLOWABLE STUD TEMPERATURE AS A FUNCTION OF FORWARD CURRENT 1N1301 SERIES RECTIFIER



HEAT-SUNK TRANSISTORS

No word had been heard from Tom Hinkelman, product planner, for many a day (he was lost in a labyrinthine maze of taskforce and study-team activities) and we considered ourselves exceedingly fortunate, t'other day, to snag him between meetings (he was rushing off to lunch).

We allowed as how we'd heard it rumored that he and his cohorts had been making a careful study of the effects displayed by some of our transistors when a heat sink was applied.

It was like striking gold. Tom stated that it has been determined that our germanium audio PNP transistors (types 2N319-thru-2N321) can be operated up to 350 mw (P_C) at 25° C. ambient, simply by applying a small clip-on heat sink.

According to Ole' Tom, the maximum junction temperature pegs down at 100° C., however, normally, the circuit thermal stability factor will limit junction temperatures within an area of from 85° C. to 90° C.

THERMAL RESISTANCE

With a clip-on heat sink, thermal resistance registers a maximum of .2°C. per mw and a typical of .175°C. per mw. Without heat sink, the maximum thermal resistance is .25°C. per mw. With an infinite heat sink, thermal resistance checks out at .11°C. per mw, maximum.

Thomas tossed a couple of the little clip-ons at us, and suggested that, with these things, our audio PNP's will dissipate from 250 mw to 275 mw in typical radio circuits, at an ambient of 40°C.

We noticed on one of the clips, we just happened to catch, that *AUGAT 6001-10A* was indelibly imprinted upon its surface. Hinkelman mentioned that these or comparable clips are, or would be soon, generally available.

That's all he had to say.

ELECTRONICS ON MANEUVERS

Electronic equipments appeared to be undergoing some mighty stringent field testing, last month, when *Electronic News* published its observations of the NATO sea maneuvers.

It was reported that those naval officers handling electronic equipment during the exercises were highly critical of the reliability and quality of components.

According to *EN*, it is freely admitted that the Navy provides the toughest test for electronic equipment, because of the elements of moisture and corrosion involved.

From the article, it appeared that the Navy boys square off on components pretty much across the board. It was reported that there is a strong feeling among officers that manufacturers should do a better job of quality control, and that not enough time is allowed to elapse between drawing board and final production.

. . . LIKE A ROSE

Transistors seem to have come out of it all quite unscathed. EN *reported that, though it was believed that there was, as yet, no fully-transistorized equipment on any of the ships, some of the officers have had experience with fully-transistorized electronic multiplex gear, which has tested out as an unqualified success.*

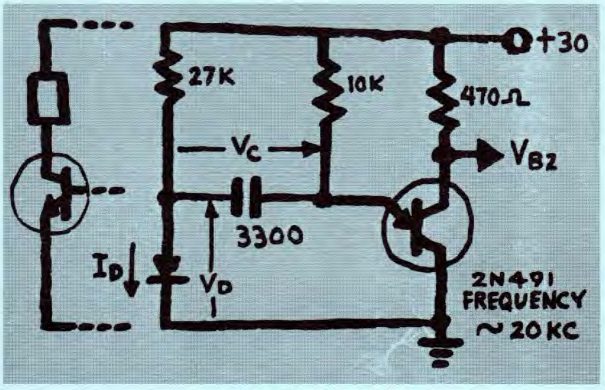
The equipment is said to save 75 per cent in space, and power requirements have declined at least 90 per cent. In addition, it is said to reduce the maintenance problem to virtually zero.

Obviously, we have the greatest navy in the world.

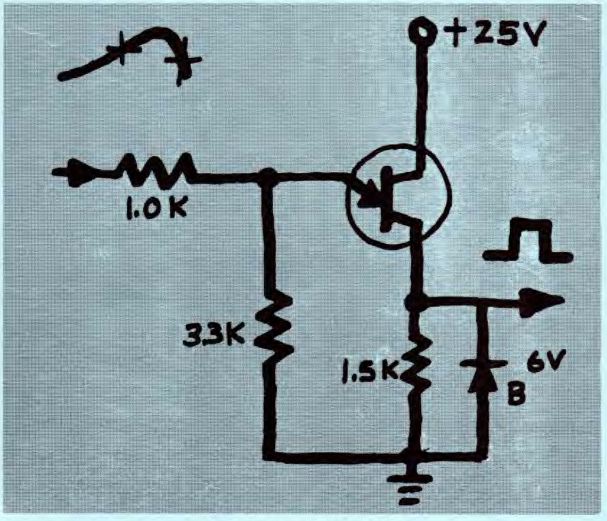
And then there's that somebody who once said that it combines the uniformity, stability and reliability of a junction transistor with the desirable characteristics of a point-contact transistor.

Anyway . . . we invented it and we're glad, because it *does* represent an entirely new concept and is considered a real and worthwhile contribution to this business of semiconductoring.

The new spec sheet is loaded with parameters, curves, and new circuit configurations. Here are a couple of sample circuits:



MULTIVIBRATOR



SCHMITT TRIGGER

You'll be getting the full spec information about the first part of November.